

Landfill Gas Collection and Control System Expansion Phase One – Upfit Modification 2014

Avery County Closed MSW Landfill Permit No. 06-91

Prepared for:

**Avery County Solid Waste
P.O. Box 640
Newland, NC 28657**



January 2015

Prepared by:

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577



PRINTED ON 100% RECYCLED PAPER

© 2015 Smith Gardner, Inc.

This document is intended for the sole use of the client for which it was prepared and for the purpose agreed upon by the client and Smith Gardner, Inc.

This page intentionally left blank.

Landfill Gas Collection and Control System Expansion Phase One – System Modification Report 2014

**Avery County Closed MSW Landfill
Permit No. 06-91**

Prepared For:

**Avery County Solid Waste
P.O. Box 640
Newland, NC 28657**



S+G Project No. : Avery 13-6

A handwritten signature in blue ink, appearing to read "Don M. Misenheimer", is written over a horizontal line.

Don M. Misenheimer
Project Scientist

A handwritten signature in blue ink, appearing to read "Joan A. Smyth", is written over a horizontal line.

Joan A. Smyth, P.G.
Senior Hydrogeologist

January 2015

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

This page intentionally left blank.

**Avery County Closed MSW Landfill
Permit No. 06-91**

**Landfill Gas Collection and Control System Expansion
Phase One – System Modification 2014**

Table of Contents

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 PHASE ONE MODIFICATION SUMMARY	1
2.1 Temporary Connection of LFG Monitoring Well P3 to Collection System.....	1
2.2 Determining Liquid Recharge Rates (W9 and W10)	1
2.3 Preliminary System Modification Effectiveness.....	2
2.4 Continuing Evaluation	2

FIGURES

Figure 1	Site Map
Figure 2	P3 Connection Detail

TABLE

Table 1	LFG Monitoring Well Network - CH ₄ Concentrations
---------	--

GRAPH

Graph 1	LFG Monitoring Well Network - CH ₄ Concentrations
---------	--

This page intentionally left blank.

1.0 INTRODUCTION

The Avery County Closed MSW Landfill is located on approximately 4.5 acres on Brushy Creek Road in Spruce Pine, North Carolina. During 2012, monitoring data indicated several issues with the existing landfill gas collection and control system (LFGCCS) due to low landfill gas quality. In response to these issues, the Phase One expansion of the LFGCCS was proposed in the *Annual Landfill Gas Monitoring Report*¹. The proposed changes were approved² by the division of Waste Management, and were subsequently implemented by Avery County (County). A Phase One Evaluation 2014 Report was submitted³ to NCDENR following the system evaluation period and recommended modification of the LFG Extraction System including the following:

- Temporary Connection of LFG Monitoring Well P3 to Collection System;
- Determining Liquid Recharge Rates (W9 and W10); and
- Preparation of a System Modification Summary report;

The above system modification was completed on September 11th and 12th, 2014. The purpose of the modification was to evaluate an additional extraction option for intercepting LFG migration away from the site. A site map is provided as **Figure 1**.

2.0 PHASE ONE MODIFICATION SUMMARY

2.1 Temporary Connection of LFG Monitoring Well P3 to Collection System

On September 11, 2014 S+G made a temporary connection from landfill gas (LFG) monitoring well P3 to the LFG extraction well W9 vacuum riser. The system modification (detail provided as **Figure 2**) was installed entirely aboveground. Connection to monitoring well P3 was made by modifying the steel casing to allow the installation of a 1" SCH40 PVC tee connection to the 1" riser of P3. A 2" to 1" PVC reducer was also installed.

The connection to the extraction well W9 vacuum riser (HDPE 4") was performed using a mechanical HDPE to PVC coupling (4" to 2"). Additionally, ball valves, sample ports, and flex hose were installed on both the P3 and W9 sides of the connection. Independent operation of P3 and W9 were maintained as a result to the above connection method.

2.2 Determining Liquid Recharge Rates (W9 and W10)

S+G conducted a recharge rate test on W9 and W10 on September 11th and 12th, 2014. This test consisted of lowering a submersible well pump to the bottom of the extraction well and pumping as much liquid out as possible into an above ground storage tank for

¹ *Annual Landfill Gas Monitoring Report*, Closed Avery County MSW Landfill. Submitted by Smith Gardner, November 2012.

² Approval response letter, Closed Avery County MSW Landfill (Annual Landfill Gas Monitoring Report). Sent by Jaclynne Drummond, Solid Waste Section, November 15, 2012.

³ Landfill Gas Collection and Control System Expansion - Phase One Evaluation 2014, Submitted by Smith Gardner, Inc., July 2014.

later disposal. S+G then took water level measurements at set time intervals to determine the rate of liquid recharge in the well.

Although liquid has recharged somewhat in W9, this extraction continues to have slotted interval open to gas flow. This is an improvement of previous conditions. The water level in W10 has not recharged, however, flow from this well has been reduced. Increase in recovery from this well may have adverse effects on liquid levels in the future. S+G will continue to monitor liquid levels in these extraction wells as well as in location P3.

2.3 Preliminary System Modification Effectiveness

Previous to the system modification, CH₄ concentrations in off-site monitoring well P11 (installed in 2011) had historically shown concentrations from 26.8 to 59.9 % CH₄ by volume. It is S+G's opinion that the modification has had a significant influence on LFG monitoring wells P3 and P11. CH₄ concentrations at both locations were brought under the 5% (CH₄ by volume) threshold and concentrations have been zero for two (2) consecutive months (as shown on the **attached Table and Graph**).

The current reduction in CH₄ concentrations in P3 and P11 appear to be directly correlated with this project. Further monitoring should confirm the current condition.

2.4 Continuing Evaluation

Preliminary evaluation of this system modification will occur through March 2015, after which time, S+G will send an update report. Further modifications may be presented at that time if warranted.

FIGURES

**Phse One - Upfit Modification 2014
Landfill Gas Collection and Control System Expansion
Avery County Closed MSW Landfill**

This page intentionally left blank.



LEGEND

- EXISTING LANDFILL GAS PROBE
- ④ OFFSITE STRUCTURE TO BE MONITORED

REFERENCES

1. ADJACENT PROPERTIES ARE FROM AVERY COUNTY GIS MAPPING DEPARTMENT.
2. MONITORING WELL LOCATIONS FROM FIELD SURVEY DATED 1/14/08, BY SURVEYING SOLUTIONS, P.C.
3. PROPERTY LINE FROM FIELD SURVEY DATED APRIL 9, 2010, BY APPALACHIAN PROFESSIONAL LAND SURVEYORS & CONSULTANTS.
4. LFG PROBES LOCATIONS FROM FIELD SURVEY DATED APRIL 9, 2010, BY APPALACHIAN PROFESSIONAL LAND SURVEYORS & CONSULTANTS. PROBE P-2, P-3, AND P-9 THROUGH P-13 LOCATIONS WERE NOT SURVEYED AND ARE APPROXIMATE.



PREPARED BY: _____ NC LIC. NO. C-0828 (ENGINEERING)

SMITH+GARDNER

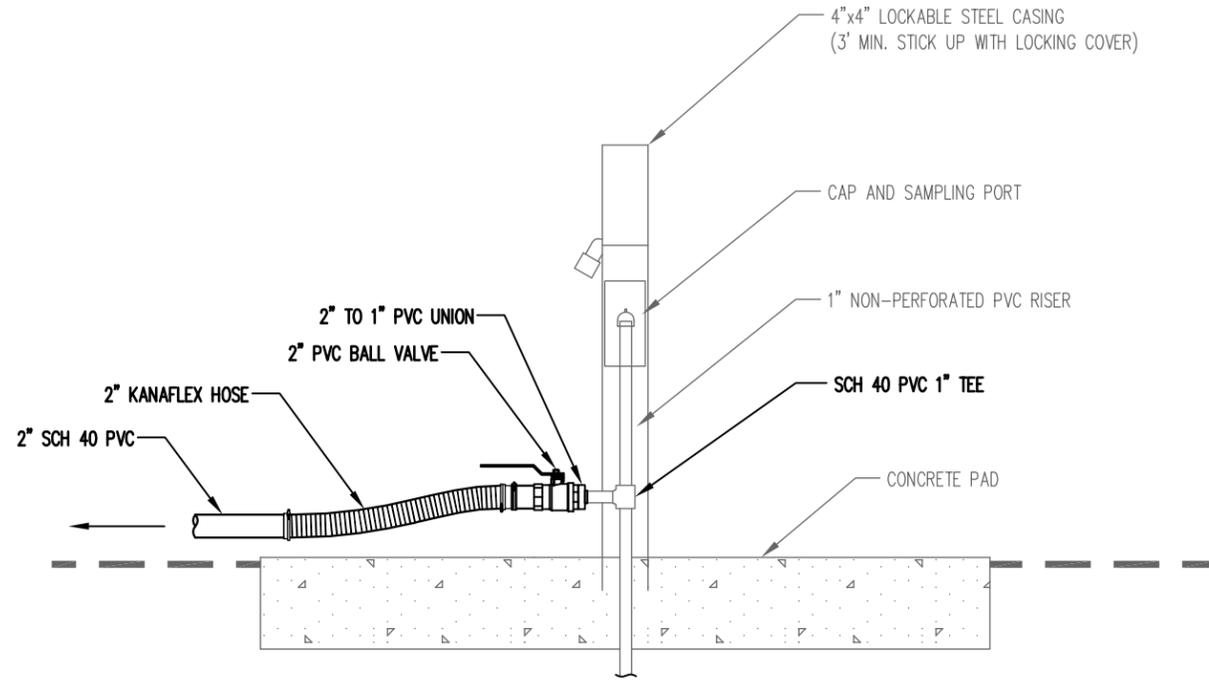
14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

FIGURE NO.	1
SCALE:	AS SHOWN
APPROVED:	D.M.M.
DRAWN:	K.C.B.
PROJECT NO.:	AVERY 14-6
DATE:	Jan 2015
FILENAME:	AVERY-B0216

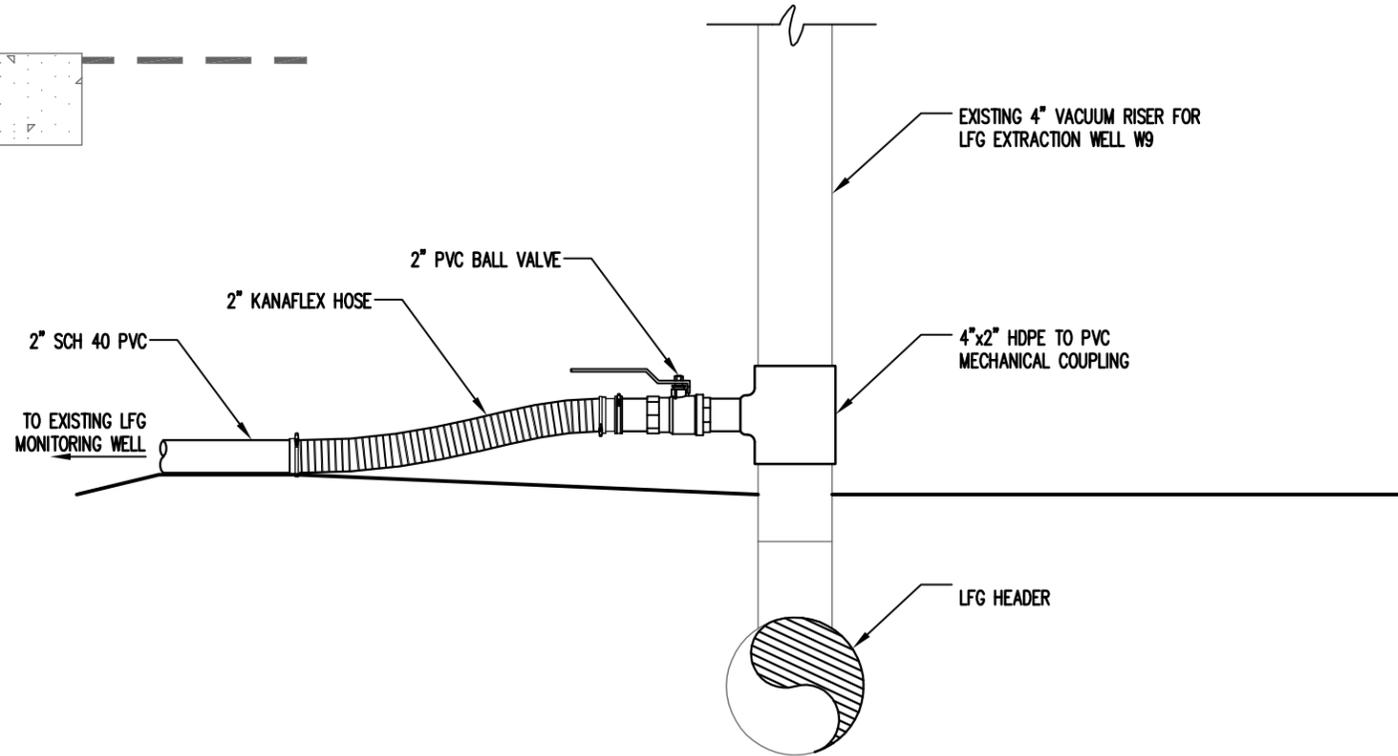
PREPARED FOR:

**LANDFILL GAS MONITORING SYSTEM
AVERY COUNTY CLOSED MSWLF
SPRUCE PINE, NORTH CAROLINA**

G:\CAD\Avery County\Avery 13-6\sheets\AVERY-B0227.dwg - 1/9/2015 12:05 PM



LANDFILL GAS MONITORING WELL CONNECTION



LANDFILL GAS EXTRACTION WELL CONNECTION

PREPARED BY: _____ NC LIC. NO. C-0628 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

FIGURE NO:	2
SCALE:	AS SHOWN
APPROVED:	D.D.M.
DRAWN:	T.R.S.
PROJECT NO:	EVERY 14-6
FILENAME:	AVERY-B0227
DATE:	Jan 2015

PREPARED FOR:

**LANDFILL GAS
WELLHEAD MODIFICATIONS
AVERY COUNTY CLOSED MSWLF
SPRUCE PINE, NORTH CAROLINA**

TABLE

**Phase One - Upfit Modification 2014
Landfill Gas Collection and Control System Expansion
Avery County Closed MSW Landfill**

This page intentionally left blank.

TABLE 1
Avery County Closed MSW Landfill
Landfill Gas Collection and Control System Monitoring
May 2011 - January 2015

DATE	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
May-11	21.8	0	54.8	0	0	0	31.8	0	NA	NA	NA	NA	NA
Jun-11	61.6	0	66.7	0	0	0	32.2	0	NA	NA	NA	NA	NA
Jul-11	56	0	64.8	0	0	0	34.9	0	NA	NA	NA	NA	NA
Aug-11	36.8	0	44.5	0	0	0	32.5	0	NA	NA	NA	NA	NA
Sep-11	29.9	0	45.5	0	0	0	33.4	0	NA	NA	NA	NA	NA
Oct-11	30	0	50.4	0	0	0	35	0	NA	NA	NA	NA	NA
Nov-11	43.8	0	54.2	0	0	0	42.3	0	0	0	36.2	0	0
Dec-11	36.8	0	44.1	0	0	0	36.7	0	0	0	39.3	0.2	1.6
Jan-12	49.4	0	0	0	0	0	36.6	0	0	0	26.8	0	2.1
Feb-12	27.3	0	36.4	0	0	0	34.4	0	0	0	41.4	0	0.6
Mar-12	65.7	0	62.9	0	0	0	35.6	0	0	0	38.2	0	1.7
Apr-12	58.1	0	51.1	0	0	0	34.2	0	0	0	45.1	0	1.9
May-12	54.5	0	2.8	0	0	0	33.1	0	0	0	34.2	0	2.3
Jun-12	56.3	0	2.3	0	0	0	36.9	0	0	0	34.9	0	1.3
Oct-12	55.1	0	63.6	0	0	0	34.2	0	0	0	47.5	0	2.4
Nov-12	56.2	0	66.3	0	0	0	37	0	0	0	41.7	0	0.1
Dec-12	52.6	0	59.7	0	0	0	42.9	0	0	0	45.7	0	0.3
Jan-13	45.9	0	49.8	0	0	0	42.7	0	0	0	39.6	0	0
Feb-13	65.6	0	64.1	0	0	0	32.3	0	0	0	53.8	0	0
Mar-13	33.6	0	58.9	0	0	0	32	0	0	0	58.4	0	1.8
Apr-13	36.7	0	59.9	0	0	0	31.4	0	0	0	59.9	0	0
May-13	28.1	0	56.2	0	0	0	24.9	0	0	0	49.1	0	0
Jun-13	17.7	0	51.9	0	0	0	28.2	0	0	0	41	0	6.5
Jul-13	27.4	0	55	0	0	0	24.2	0	0	0	46.2	0	0
Aug-13	9	0	60.8	0	0	0	26.1	0	0	0	41.7	0	0
Sep-13	7.3	0	63.7	0	0	0	33.3	0	0	0	58.2	0	0
Oct-13	8.1	0	50.4	0	0	0	32.1	0	0	0	54.2	0	0
Nov-13	4.1	0	19.2	0	0	0	33.1	0	0	0	41.4	0	0.8
Dec-13	34.8	0	47.7	0	0	0	32.2	0	0	0	39.7	0	1.8
Jan-14	36.2	0	48	0	0	0	39.9	0	0	0	44.7	0	0
Feb-14	58.4	0	62.6	0	0	0	33	0	0	0	53.3	0	3.2
Mar-14	61.3	0	0	0	0	0	29.3	0	0	0	43.1	0	1.8
Apr-14	59.4	0	40.2	0	0	0	30.1	0	0	0	52.7	0	0
May-14	66.2	0	52.8	0	0	0	29.3	0	0	0	50.3	0	3.9
Jun-14	61.8	0	54.7	0	0	0	28	0	0	0	50.2	0	2.9
Jul-14	63.2	0	61.1	0	0	0	27.9	0	0	0	50.6	0	3.1
Aug-14	38.3	0	45.9	0	0	0	26.7	0	NA	0	47.2	0	3.1
Sep-14	47.5	0	36.6	0	0	0	29.3	0	0	0	15.9	0	3.4
Oct-14	37.4	0	1.3	0	0	0	29.8	0	0	0	0.1	0	2.3
Nov-14	26	0	0	0	0	0	30.1	0	0	0	1.1	0	2.7
Dec-14	43.4	0	0	0	0	0	29.2	0	0	0	0	0.9	3
Jan-15	42	0	0	0	0	0	32.5	0	0	0	0	0.6	3.6

This page intentionally left blank.

GRAPH

**Phase One - Upfit Modification 2014
Landfill Gas Collection and Control System Expansion
Avery County Closed MSW Landfill**

This page intentionally left blank.

Avery County MSW Landfill Landfill Gas Monitoring Well Network Methane Concentrations Between May 2011 and January 2015

% CH4 by
 Volume

